

west part of the Gulf of Saint Lawrence. On the 6th a storm was central west of Bermuda, and the pressure fell to 29.65 (753) at Bermuda, with fresh south wind; moving thence northeast the storm was central over the Banks of Newfoundland on the 7th, with pressure below 29.70 (754), whence it passed north of the region of observation by the 8th. The storm which was central over the Gulf of Saint Lawrence on the 5th and 6th probably moved southeastward and united with this storm. On the 7th a storm was central off Ireland, whence it apparently moved southeast and disappeared over France by the 9th. On the 10th a storm was central about midway between the Azores and the Grand Banks, where it remained nearly stationary until the 12th, after which it disappeared.

On the 11th a storm of slight energy was central north of the Bahamas, from which position it moved north of east and on the 12th was central west of Bermuda, where the pressure fell to 29.73 (755). Moving thence northeast the storm was central south of Nova Scotia on the 13th, off east Nova Scotia on the 14th, and by the 15th had disappeared north of the region of observation. On the 14th and 15th a storm of moderate energy was central off the south Atlantic coast; on the 16th it was off the middle Atlantic coast, and by the 17th had advanced to New Brunswick, after which it passed northeast over the Gulf of Saint Lawrence and disappeared north of the region of observation. On the 15th a storm was apparently central over the North Sea. From the 17th to 24th the pressure continued low over and near the British Isles, and on the 23d and 24th a storm apparently moved eastward from west of Ireland. From the 22d to 24th a storm of moderate strength moved from the Gulf of Saint Lawrence to the north edge of the Grand Banks, after which it passed north of the region of observation. From the 26th to the close of the month the pressure continued low over the British Isles and the ocean to the westward. On the 26th and 27th a storm passed over the Gulf of Saint Lawrence and thence north of Newfoundland. On the 28th a storm of slight energy was central over the east part of the Gulf of Mexico, and on the 31st a storm was central over the Banks of Newfoundland.

FOG IN MAY.

The limits of fog-belts west of the 40th meridian, as determined from reports of shipmasters, are shown on Chart I by dotted shading. Near the Banks of Newfoundland fog was re-

ported on 12 dates; between the 55th and 65th meridians on 11 dates; and west of the 65th meridian on 8 dates. Compared with the corresponding month of the last 3 years the dates of occurrence of fog near the Grand Banks numbered 8 less than the average; between the 55th and 65th meridians 4 less than the average; and west of the 65th meridian 12 less than the average. On the dates fog was reported in the regions referred to it occurred with the approach or passage of general storms.

OCEAN ICE IN MAY.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for May during the last 9 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
May, 1883	40 30	47 00	May, 1883	45 40	45 12
May, 1884	41 30	47 30	May, 1884	43 30	44 50
May, 1885	40 50	48 15	May, 1885	42 30	40 10
May, 1886	41 30	51 30	May, 1886	48 55	46 13
May, 1887	39 35	46 00	May, 1887	39 35	46 00
May, 1888	41 00	46 00	May, 1888	41 00	46 00
May, 1889	43 07	55 47	May, 1889	49 46	36 48
May, 1890	40 50	50 28	May, 1890	44 12	36 25
May, 1891	40 49	49 07	May, 1891	48 00	45 00
Mean	41 06	49 04	Mean	44 48	42 58

On the 7th 3 small pieces of ice were reported in N. 49° 03', W. 33° 40'.

The southernmost ice reported, a small berg noted on the 13th, was about one-fourth degree south, and the easternmost ice, icebergs observed on the 11th, was 2° west of the average southern and western limits of ice for the month, as determined from reports of the last 8 years. For the current month ice was most frequently reported along the east edge of the Banks of Newfoundland. During the latter half of the month icebergs were reported near the southeast Newfoundland coast. In the early part of the month field ice interfered with navigation on the Cape Breton and east Nova Scotia coasts and about the Magdalen Islands in the Gulf of Saint Lawrence. Compared with the corresponding month of preceding years the ice reported for the current month about corresponded in quantity and distribution with the May average. The limits of the region within which Arctic ice was reported for May, 1891, are shown on Chart I by ruled shading.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for May, 1891, is exhibited on Chart II by dotted isotherms. In the table of Signal Service data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

The mean temperature was highest in the central and east parts of San Diego Co., Cal., and at stations in the middle Gila valley, where it was above 80, and the mean readings were above 70 over the south part of the east and west Gulf states, in Florida, the adjoining parts of west Arizona and southeast California, and at stations in the Sacramento and San Joaquin valleys. The mean temperature was lowest at mountain stations in central Colorado, where it was below 40, and it was below 50 in east and north New England, over the north part

of the Lake region, and generally at Canadian stations east of the 105th meridian. On the southeast New England coast, and at stations on the immediate Pacific coast north of San Francisco, Cal., the mean temperature was below 55.

The mean temperature was below the normal, except in the Canadian Maritime Provinces, and within an area extending from the north Pacific coast southeastward over the middle plateau region, and thence to Lake Superior. The greatest departure below the normal temperature occurred in the middle Ohio valley, where it was more than 4, and the departure below the normal was 2 or more on the middle and south Pacific coasts and in southwest Arizona, and from the southeast slope of the Rocky Mountains eastward to the Atlantic coast states, New York City being the only station south of the Lake region where the mean temperature was above the normal. In districts where the mean temperature was above the normal the departure was less than 2, except at Chatham, N. B., and Spokane Falls, Wash., where it was 3.5 and 2.8, respectively.

On the 5th unusually cold weather prevailed east of the Missouri and Mississippi rivers, freezing weather being reported generally in the Lake region, Minnesota, and the Da-

kotas. At Detroit, Mich., the minimum temperature, 28, was 1 lower than previously reported during the first decade of May. Unusually cold weather prevailed in the regions referred to until the 7th, on which date the minimum temperature at Lynchburgh, Va., and Raleigh, N. C., 34 and 38, respectively, was the lowest on record for those stations for the first decade of May by 1 and 2. The lowest minimum temperature reported for May was noted at stations in the lower lake region on the 5th. On the 11th unusually low temperature prevailed in Kansas, and at Dodge City and Concordia the minimum temperature, 32 and 34, respectively, was about 4 below the lowest temperature on record for the second decade of May. On the 17th unusually low temperature for the season prevailed in Michigan, Ohio, West Virginia, west Pennsylvania, and west New York; at Parkersburgh, W. Va., Columbus, Ohio, Erie, Pa., Port Huron and Manistee, Mich., the minimum temperature was 2 to 4 lower than previously recorded during the second decade of May. At Lynchburgh, Va., the minimum temperature, 40, was as low as any on record for the season.

The mean temperature from January to May, inclusive, averaged about normal in the south Atlantic and east Gulf states, the Rio Grande and Missouri valleys, the Ohio Valley and Tennessee, and along the north and south Pacific coasts. In the extreme northwest the mean temperature for this period averaged about 3 above the normal; in the upper Lake region about 2 above; and in New England, the middle Atlantic states, the lower Lake region, the upper Mississippi valley, and over the northern plateau about 1 above the normal. In the southern and middle plateau regions the mean temperature was about 2 below the normal; and at Key West, Fla., in the west Gulf states, on the eastern slope of the Rocky Mountains, and on the middle Pacific coast it was about 1 below the normal.

The highest mean temperature ever reported for May occurred on the Pacific coast north of the Columbia River in 1889, when the mean temperature was 2 to 3 above the normal; over the southern plateau and southeast slope of the Rocky Mountains in 1886, when the mean temperature was 3 to 5 above the normal; in the Sacramento Valley and on the south Pacific coast in 1885, when the mean temperature was 1 to 2 above the normal; in the upper Mississippi and middle Ohio valleys in 1881, when the mean temperature was 6 to 10 above the normal; and in the Lake region, the middle Atlantic and New England states, the lower Missouri valley, Arkansas, and Tennessee in 1880, when the mean temperature was 6 to 9 above the normal in the Lake region, 6 to 7 above in the middle Atlantic and New England states, and 4 to 7 above in the lower Missouri valley, Arkansas, and Tennessee.

The lowest mean temperature ever reported for May was noted at Lynchburgh, Va., where the mean temperature was 3.5 below the normal, and 0.2 below 1873; at Wellsborough, Pa., where the mean temperature was 5.8 below the normal, and 0.1 below 1882; at Savannah, Ga., where the mean temperature was 4.0 below the normal, and 0.8 below 1882; at Jacksonville, Fla., where the mean temperature was 2.0 below the normal, and 0.8 below 1887; at Key West, Fla., where the mean was 2.8 below the normal, and 0.5 below 1887; at Grand Coteau, La., where the mean was 4.3 below the normal, and 2.8 below 1889; at Shreveport, La., where the mean was 4.1 below the normal, and 0.2 below 1882; at Abilene, Tex., where the mean was 3.0 below the normal, and 0.8 below 1888; at Indianapolis, Ind., where the mean was 3.3 below the normal, and 0.6 below 2 or more years; at Cincinnati, Ohio, where the mean was 4.9 below the normal, and 1.4 below 1882; at Yuma, Ariz., where the mean was 3.6 below the normal, and 0.2 below 1883; and at Keeler, Cal., where the mean was 2.2 below 1888. The lowest mean temperature reported for May occurred from the west part of the Lake region to the northeast slope of the Rocky Mountains in 1888, when the mean temperature was 3 to 7 below the normal; over the southeast part of the plateau region in 1884, when the mean was 3 to 4 below the normal; from the middle Atlantic states and west New England west-

ward over the lower lake region and middle Mississippi valley, Kansas, and east Colorado in 1882, when the mean temperature was 3 to 6 below the normal in the middle Atlantic states and New England, and 3 to 7 below over the east part of the Lake region and the middle Mississippi valley, Kansas, and east Colorado.

(5) DEVIATIONS FROM NORMAL TEMPERATURE.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for May for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for May, 1891; (4) the departure of the current month from the normal; (5) and the extreme monthly mean for May, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of May.	(2) Length of record.	(3) Mean for May, 1891.	(4) Departure from normal.	(5) Extreme monthly mean for May.			
						Highest.	Year.	Lowest.	Year.
<i>Arkansas.</i>		°	Years	°	°	°		°	
Lead Hill.....	Boone.....	67.9	9	64.6	- 3.3	74.4	1886	62.9	1882
<i>California.</i>									
Sacramento.....	Sacramento.....	64.1	38	59.6	- 4.5	70.2	1865	58.5	1860
<i>Connecticut.</i>									
Middletown.....	Middlesex.....	57.1	24	56.4	- 0.7	61.3	1864	52.4	1861
<i>Florida.</i>									
Merritt's Island.....	Brevard.....	75.4	9	75.4	0.0	79.2	1884	70.3	1886
<i>Georgia.</i>									
Forsyth.....	Monroe.....	72.7	17	72.0	- 0.7	75.8	1880	69.2	1877
<i>Illinois.</i>									
Peoria.....	Peoria.....	64.5	35	62.0	- 2.5	71.4	1881	55.2	1867
Riley.....	McHenry.....	57.2	35	55.3	- 1.9	64.4	1881	49.8	1867
<i>Indiana.</i>									
Vevay.....	Switzerland.....	65.1	24	61.4	- 3.7	71.2	1880	60.4	1867
<i>Iowa.</i>									
Cresco.....	Howard.....	56.4	19	56.1	- 0.3	64.1	1881	49.9	1888
Monticello.....	Jones.....	59.4	37	58.0	- 1.4	68.1	1881	51.8	1867
Logan.....	Harrison.....	62.1	17	61.2	- 0.9	71.3	1880	56.1	1878
<i>Kansas.</i>									
Lawrence.....	Douglas.....	65.0	29	61.2	- 3.8	70.6	1880	55.5	1867
Wellington.....	Sumner.....	65.1	12	66.9	+ 1.8	71.1	1880	58.2	1882
<i>Louisiana.</i>									
Grand Coteau.....	Saint Landry.....	74.7	8	70.4	- 4.3	75.7	1884	70.4	1891
<i>Maine.</i>									
Orono.....	Penobscot.....	51.7	21	51.2	- 0.5	55.9	1887	41.8	1884
<i>Maryland.</i>									
Cumberland.....	Alleghany.....	66.0	28	60.9	+ 0.9	67.0	1880	51.1	1866
<i>Massachusetts.</i>									
Amherst.....	Hampshire.....	57.1	55	55.8	- 1.3	64.2	1880	49.8	1837
Newburyport.....	Essex.....	55.5	12	54.8	- 0.7	61.0	1880	50.2	1882
Somerset.....	Bristol.....	58.5	18	58.7	+ 0.2	63.6	1880	51.7	1882
<i>Michigan.</i>									
Kalamazoo.....	Kalamazoo.....	57.5	14	57.0	- 0.5	66.0	1881	41.3	1882
Thornville.....	Lapeer.....	57.5	14	56.1	- 1.4	66.6	1880	46.9	1877
<i>Minnesota.</i>									
Minneapolis.....	Hennepin.....	57.1	26	58.8	+ 1.7	63.4	1887	47.9	1867
<i>Montana.</i>									
Fort Shaw.....	Lewis & Clarke.....	54.2	22	53.4	- 0.8	59.8	1869	47.4	1883
<i>New Hampshire.</i>									
Hanover.....	Grafton.....	54.4	56	53.0	- 1.4	62.0	1880	48.7	1850
<i>New Jersey.</i>									
Moorestown.....	Burlington.....	60.6	27	59.3	- 1.3	68.0	1880	54.4	1882
South Orange.....	Essex.....	60.5	19	57.8	- 2.7	60.4	1880	57.3	1885
<i>New York.</i>									
Cooperstown.....	Otsego.....	54.6	37	51.9	- 2.7	60.7	1880, '87	46.7	1861
Palermo.....	Oswego.....	54.8	37	53.3	- 1.5	60.9	1887	47.5	1867
<i>North Carolina.</i>									
Lenoir.....	Caldwell.....	62.6	18	62.6	0.0	67.8	1887	48.0	1881
<i>Ohio.</i>									
N'th Lewisburgh.....	Champaign.....	61.4	59	58.8	- 2.6	68.0	1887	53.0	1835
Wauseon.....	Fulton.....	58.7	21	56.5	- 2.2	64.3	1880	52.2	1852
<i>Oregon.</i>									
Albany.....	Linn.....	53.8	14	57.4	+ 3.6	61.4	1890	52.4	1880
Eola.....	Polk.....	54.2	21	55.2	+ 1.0	59.1	1883	45.2	1880
<i>Pennsylvania.</i>									
Dyberry.....	Wayne.....	54.4	24	52.0	- 2.4	64.1	1880	43.7	1865
Grampian Hills.....	Clearfield.....	56.5	26	56.1	- 0.4	65.1	1887	48.8	1867
Wellsborough.....	Tioga.....	56.2	12	50.4	- 5.8	68.4	1879	50.4	1891
<i>South Carolina.</i>									
Statesburgh.....	Sumter.....	70.3	10	68.1	- 2.2	73.8	1881	65.9	1885
<i>Tennessee.</i>									
Austin.....	Wilson.....	69.2	22	65.4	- 3.8	79.2	1887	64.5	1877
<i>Texas.</i>									
New Ulm.....	Austin.....	74.4	18	73.0	- 1.4	77.4	1879	72.0	1885
<i>Vermont.</i>									
Stratford.....	Orange.....	55.7	18	53.8	- 1.9	63.0	1887	50.5	1882
<i>Virginia.</i>									
Birdsnest.....	Northampton.....	65.2	23	63.0	- 2.2	73.7	1880	60.8	1869
<i>Washington.</i>									
Fort Townsend.....	Jefferson.....	54.0	19	54.4	+ 0.4	57.0	1889	50.2	1880
<i>Wisconsin.</i>									
Madison.....	Dane.....	56.5	22	56.0	- 0.5	64.2	1870	51.5	1883

MAXIMUM AND MINIMUM TEMPERATURES.

The maximum temperature was highest in adjoining parts

of west Arizona and southeast California, where it was above 100, and the temperature rose above 90 in the Sacramento, San Joaquin, and Gila valleys, in southeast Washington, in the Dakotas, east Montana, central Nebraska, west Minnesota, in the Rio Grande Valley, and generally in the east Gulf and south Atlantic states. The maximum temperature was lowest at stations along the immediate Pacific and east and southeast New England coasts, where it was below 70. At Bismarck, N. Dak., the maximum temperature, 93, was 1 higher than previously reported for May. The reports of United States Army post surgeons and voluntary observers show the following maximum temperatures in states and territories where temperature rising to or above 90 was reported: Volcano Springs, Cal., 110; Texas Hill, Ariz., and Glendive, Mont., 108; Clark, S. Dak., and Americus, Ga., 102; Moab, Utah, 101; Fort Ringgold and Sierra Blanca, Tex., Columbus (2), Miss., and Bassett and Long Pine, Nebr., 100; Wiggins, Ala., 99; Fenelon, Nev., 98; Weston, Oregon, Harriman, Tenn., Fort Fetterman, Wyo., and Lead Hill, Ark., 97; Deming, N. Mex., and Nottoway C. H., Va., 96; Chapel Hill, N. C., Ellendale, N. Dak., Blackville, S. C., Fort Barrancas, Fla., several stations in Kansas, and Cheneyville, La., 95; Placerville, Idaho, Glenwood (1), Iowa, and Crookston, Minn., 94; Portsmouth (2), Ohio, Lamar, Colo., Carlisle and McConnellsburgh, Pa., McLeansborough, Ill., and Oak Ridge, Mo., 93; several stations in New Jersey, Westborough, Mass., and Fort Simcoe, Wash., 92; Cumberland (2), Md., 91; Nashua and Plymouth, N. H., several stations in New York, Brattleborough (1), Vt., Westfield, Wis., Rockville, Ind., Fort Supply, Ind. T., and several stations in Kentucky, 90.

The lowest temperature reported by a regular station of the Signal Service was 15 at Fort McKinney, Wyo., and the temperature fell below 20 in north North Dakota and northwest Minnesota. The minimum temperature was below 30 over the northern part of the country from north New England and the Saint Lawrence Valley to east Washington and Oregon, and southward over the east part of the plateau region to north-central New Mexico. The highest minimum temperature occurred along the immediate west Gulf coast and over south Florida, where it was above 60. At the following-named stations of the Signal Service the minimum temperature was as low or lower than previously reported for May: Eastport, Me., 32, the same as 1888; New London, Conn., 31, 1 below 2 more years; Philadelphia, Pa., 36, the same as 1880; Atlantic City, N. J., 33, the same as 2 or more years; Lynchburgh, Va., 34, 3 below 1876; Charlotte, N. C., 38, the same as 1889; Augusta, Ga., 42, the same as 1877; New Orleans, La., 53, 1 below 1889; Palestine, Tex., 46, the same as 1887; Columbus, Ohio, 34, the same as 1883; Buffalo, N. Y., 28, 1 below 1876; Detroit, Mich., 29, the same as 1875; Dodge City, Kans., 32, the same as 1884; Bismarck, N. Dak., 20, the same as 1888; Fort Buford, N. Dak., 17, 3 below 1885; Keeler, Cal., 36, the same as 1889, and Neah Bay, Wash., 33, the same as 1889. The reports of United States Army post surgeons and voluntary observers show the following minimum temperatures in states and territories where minimum temperature falling to or below 32 was reported: Breckenridge, Colo., 1; Hayward, Wis., Camp Poplar River, Mont., Leech Lake and Pokegama Falls, Minn., and Fort Pembina, N. Dak., 15; Silver Lake, Oregon, 16; Evart and Gaylord, Mich., 17; Plattsburgh Barracks, N. Y., 19; Dyberry, Pa., Fort Meade, S. Dak., Bonanza and Placerville, Idaho, and Fort Niobrara, Nebr., 20; Eureka, Nev., Fort D. A. Russell, Wyo., and Indianola, Iowa, 21; Franklin, N. C., Garrettsville, Ohio, and Ludlow (1), Mass., 22; Berlin Falls, N. H., East Berkshire, Vt., and Valparaiso, Ind., 23; Allaire, N. J., Sterling, Kans., and Fairfield and Mayfield, Me., 24; Nephi, Utah, 26; Fort Adams, R. I., Lexington and Marion, Va., Cooley's, Ariz., Cisco, Cal., Canton, Conn., and Centreville, Mo., 27; Estalina Springs and Monero, N. Mex., and several stations in Illinois, 28; Waterville, Wash., and Caddo and Harrodsburgh, Ky., 29; Springdale, Tenn., Weatherford, Tex., and Alderson and Pleasant Hill, W. Va., 30; Dover, Del., 32.

LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather is shown on Chart IV by a line traced from the Maine coast westward over the south part of the Lake region, south Wisconsin, and south Minnesota, thence southwest to central Colorado, thence south to north-central New Mexico, and thence to north Nevada, and the western limit of freezing weather is shown by this line continued northward over Oregon and east Washington.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature are given in the table of Signal Service data. The greatest monthly ranges occurred in North Dakota, northwest Minnesota, and east Montana, where they exceeded 70, whence they decreased eastward to the east and southeast New England coasts, where they were less than 40, southeastward to less than 30 at Hatteras, N. C., and to less than 20 at Key West, Fla., southward to less than 30 on the immediate west Gulf coast, southwestward to less than 20 at San Diego, Cal., and westward to less than 30 along the immediate middle and north Pacific coasts.

FROST.

The following reports of frost injurious to vegetation have been made by regular and voluntary observers of the Signal Service: On the 3d frost killed tender vegetation at Huron, S. Dak. At Grand Haven, Mich., the frost of the 3d, 5th, 6th, and 7th injured peaches and strawberries on low land. On the 4th frost killed fruit blossoms at Garrettsville, Ohio, Holland, Mich., and South Bend, Ind. At Beverly, N. J., the frost of the 4th and the 6th injured strawberries. On the 5th severe frost occurred from Maine westward to the Dakotas, causing damage to crops and fruit. From the 5th to the 7th killing frost occurred throughout the Lake region, the Ohio, upper Mississippi, and Missouri valleys, and as far south as North Carolina and southern Tennessee. On the 6th frost damaged fruit at Southington, Conn. Frost was also reported on this date at Fall River, Mass., and in New Jersey and Connecticut. On the 7th frost injured tender vegetation at University, Miss. On the 10th frost killed tender plants at Taylor's Ranch, Utah, and caused damage to wheat, garden vegetables, and fruit at Salina, Kans. On the 11th frost injured small fruit and vines at points in Kansas and Nebraska. On the 13th frost injured fruit at Downs, Kans. Killing frost was reported at Huron, S. Dak., and Hudson, Mich., on the 16th. On the 17th killing frost occurred throughout Michigan and generally in central and northern Ohio, where serious damage was caused to tender plants and fruit. Killing frost was also reported on this date in parts of Iowa, west Pennsylvania, central New York, southern Maine, and West Virginia. On the 19th heavy frost occurred in many localities in Maine, New Hampshire, and central Massachusetts; and light frost caused slight damage at Rocky Ford, Colo. On the 21st garden vegetables were injured at Bangor, S. Dak. Frost killed vegetables at Farmington, Me., on the 23d. On the 27th killing frost occurred in western and central New York, at Grampian Hills and Wellsborough, Pa., and at points in Ohio and Illinois.

Compared with the preceding month the southern limit of frost in the Atlantic coast states was 5° to 6° farther north; in the east Gulf states 2° to 3° farther north; and in the west Gulf states 5° to 6° farther north. In the plateau region frost occurred in the mountains of Arizona and at Carson City, Nev., for each month. In California frost was reported as far south as Keeler in April, while for the current month no frost was reported on the Pacific coast south of the 42d parallel.

East of the Mississippi River and in Arkansas frost occurred over the northern half of the east Gulf states on the 7th and 8th. It was noted in southern Kansas on the 11th; at Santa Fe, N. Mex., on the 5th and 15th; in the mountains of central Arizona on a number of dates, and in west Washington and Oregon on the 8th and 9th.

Compared with the average date of last killing frost the frost of the 5th to 7th in North Carolina and of the 7th in

north Mississippi was about 7 weeks later than usual; that of the 5th to 7th in Tennessee was about 5 weeks late; that of the 13th in Kansas, of the 17th in West Virginia, and of the 27th in Ohio and New York was about 4 weeks late; and that of the 11th in Nebraska and of the 17th in Michigan and Iowa was about 2 weeks late.

NORMAL TEMPERATURE FOR MAY

The normal distribution of temperature in the United States for May is shown by Chart No. V. The data used in the preparation of the chart were supplied largely by the records of observations at Signal Service stations for the twenty years—1871 to 1890. On this chart are given in plain figures the temperature as read at Signal Service stations at some elevation above the sea; underscored figures indicate temperatures observed at voluntary stations.

The instruments and methods employed during those years were substantially uniform at all stations, and the results for Signal Service stations, while not strictly comparable, owing to differences of exposure, are yet deemed fairly satisfactory. The hours of observation were changed a number of times and the method of obtaining the mean was not always the same. In order, therefore, to determine the error of a twenty-year mean derived from a combination of different hours, it was decided to reduce the 20-year value for 12 representative stations to the equivalent of a 20-year homogeneous series of observations. Mr. Alexander McAdie was charged with these reductions. He selected the following stations: New Orleans, La.; Washington City; Omaha, Nebr.; Saint Louis, Mo.; Saint Paul, Minn.; Philadelphia, Pa.; Boston, Mass.; Cleveland, Ohio; Milwaukee, Wis., and Cheyenne, Wyo. He first obtained the curve of diurnal variation for each station, as elsewhere described (see explanation of "Decade Normal Temperature Charts," O. C. S. O., June 15, 1891), and drew therefrom the appropriate corrections to reduce the mean of any hour, or combinations of hours, to the true mean.

It was found that the errors of the several combinations of hours very nearly neutralized each other, thus at New Orleans, La., for January the error of—

- Series No. 1, Nov., 1870, to Aug., 1872, was $-0^{\circ}.2$;
- Series No. 2, Aug., 1872, to Oct., 1879, was $0^{\circ}.0$;
- Series No. 3, Nov., 1879, to Dec., 1884, was $0^{\circ}.0$;
- Series No. 4, Jan., 1885, to Dec., 1886, was $0^{\circ}.0$;
- Series No. 5, Jan., 1887, to Jan., 1888, was $+0^{\circ}.3$;
- Series No. 6, July, 1888, to Dec., 1891, was $-0^{\circ}.2$.

Having found for each month and a number of localities the corrections necessary to reduce the non-homogeneous mean to a homogeneous mean, it was clearly shown that the two were almost identical, and that no appreciable error would obtain in drawing isothermal lines from the uncorrected means. The data were, therefore, charted without applying any corrections whatever.

A number of records made by reliable voluntary observers and U. S. Army surgeons were used in portions of the country not covered by Signal Service observations. The hours of observation at these stations were, as a rule, 7 a. m., 2 and 9 p. m. No corrections to reduce the means so obtained to the true mean have been applied. While these charts leave something to be desired in accuracy and completeness, they are desirable and important contributions at this time.

Table of normal temperature for May—Signal Service stations.

Stations.	Length of record.	Normal.	Stations.	Length of record.	Normal.
Albany, N. Y.	17	59.9	Lynchburg, Va.	19	66.3
Alpena, Mich.	18	49.3	Marquette, Mich.	26	49.3
Atlanta, Ga.	12	68.6	Memphis, Tenn.	20	70.0
Atlantic City, N. J.	17	57.1	Milwaukee, Wis.	20	53.0
Augusta, Ga.	19	72.5	Mobile, Ala.	20	73.8
Baltimore, Md.	20	64.4	Montgomery, Ala.	18	73.0
Bismarck, N. Dak.	16	54.6	Morgantown, W. Va.	11	62.6
Boise City, Idaho	24	56.8	Nashville, Tenn.	20	68.8
Boston, Mass.	20	56.3	New Haven, Conn.	18	57.8
Brownsville, Tex.	16	78.5	New London, Conn.	20	56.4
Buffalo, N. Y.	20	53.9	New Orleans, La.	20	74.7
Butford, Fort, N. Dak.	12	54.6	New York City	20	59.3
Cairo, Ill.	20	67.8	Norfolk, Va.	20	66.0
Charleston, S. C.	20	72.7	North Platte, Nebr.	16	58.4
Charlotte, N. C.	12	68.9	Olympia, Wash.	18	55.0
Chattanooga, Tenn.	12	68.2	Omaha, Nebr.	20	62.1
Cheyenne, Wyo.	20	50.8	Oswego, N. Y.	20	54.4
Chicago, Ill.	20	56.4	Pensacola, Fla.	10	73.8
Cincinnati, Ohio	20	65.2	Philadelphia, Pa.	20	62.2
Cleveland, Ohio	20	58.0	Pittsburg, Pa.	20	62.4
Columbus, Ohio	12	61.4	Portland, Me.	20	55.4
Davenport, Iowa	19	61.1	Portland, Oregon	20	57.2
Denver, Colo.	19	56.5	Prescott, Ariz.	14	60.2
Des Moines, Iowa	12	61.1	Red Bluff, Cal.	13	67.1
Detroit, Mich.	20	57.7	Rochester, N. Y.	20	59.4
Dodge City, Kans.	16	63.1	Roseburg, Oregon	14	56.9
Dubuque, Iowa	18	60.3	Sacramento, Cal.	14	61.0
Duluth, Minn.	20	48.3	Saint Louis, Mo.	20	66.0
Eastport, Me.	18	47.4	Saint Paul, Minn.	20	57.9
El Paso, Tex.	12	73.7	Saint Vincent, Minn.	11	52.0
erie, Pa.	18	57.2	Salt Lake City, Utah	17	58.0
Escamaba, Mich.	20	49.1	San Diego, Cal.	20	61.2
Galveston, Tex.	20	76.0	San Luis, Ohio	14	59.4
Grand Haven, Mich.	20	54.9	San Francisco, Cal.	20	56.7
Indianapolis, Ind.	20	63.7	Santa Fe, N. Mex.	20	57.2
Jacksonville, Fla.	19	75.1	Savannah, Ga.	20	73.5
Keokuk, Iowa	19	63.9	Shreveport, La.	20	73.4
Key West, Fla.	20	79.6	Toledo, Ohio	20	59.9
Knoxville, Tenn.	20	66.4	Vicksburg, Miss.	19	53.0
La Crosse, Wis.	18	59.7	Washington City	20	64.2
Leavenworth, Kans.	20	64.7	Wilmington, N. C.	20	69.9
Los Angeles, Cal.	14	62.2	Yankton, S. Dak.	18	59.2
Louisville, Ky.	19	66.9	Yuma, Ariz.	15	77.4

Signal Service, post hospital, voluntary, and stations of the Canadian meteorological service.

Stations.	Length of record.	Normal.	Stations.	Length of record.	Normal.
Amherst, Mass.	53	56.9	Lenoir, N. C.	19	63.7
Astoria, Oregon	20	52.8	Lunenburg, Vt.	40	52.8
Austin, Tex.	35	74.2	Marietta, Ohio	57	62.4
Bidwell, Fort, Cal.	23	55.1	McDowell, Fort, Ariz.	24	78.2
Bowie, Fort, Ariz.	22	71.1	McIntosh, Fort, Tex.	23	81.6
Brady, Fort, Mich.	51	49.8	Mohave, Fort, Ariz.	26	80.4
Bridge, Fort, Wyo.	27	46.6	Monterey, Cal.	26	58.0
Brooke, Fort, Fla.	31	74.6	Montreal, Quebec	56	55.2
Burlington, Vt.	49	55.8	North Lewisburgh, Ohio	59	61.4
Canton, N. Y.	27	56.8	Northport, Mich.	18	51.9
Chatham, N. B.	16	48.3	Parry Sound, Ont.	15	50.8
Clark, Fort, Tex.	18	77.3	Peoria, Ill.	35	63.8
Colville, Fort, Wash.	18	55.5	Promontory, Utah	19	58.2
Cooperstown, N. Y.	34	54.5	Quebec, Quebec	44	50.2
Craig, Fort, N. Mex.	21	70.1	Randall, Fort, S. Dak.	20	61.2
Danville, Ky.	18	65.9	Ripley, Fort, Minn.	27	55.5
Davis, Fort, Tex.	20	70.9	Rockliffe, Ont.	14	51.0
Engle Pass, Tex.	22	80.6	San Antonio, Tex.	24	76.0
Father Point, Quebec	14	43.5	Saugeen, Ont.	16	59.2
Fort Smith, Ark.	25	69.1	Shaw, Fort, Mont.	22	54.1
Gaston, Fort, Cal.	27	66.3	Sill, Fort, Oklahoma T.	29	70.1
Gibson, Fort, Ind. T.	46	69.6	Stanton, Fort, N. Mex.	15	66.6
Granman Hills, Pa.	26	56.4	Sydney, C. B. I.	21	44.9
Grant, Fort, Ariz.	24	70.4	Toronto, Ont.	51	52.1
Green Springs, Ala.	28	70.6	Totten, Fort, N. Dak.	21	53.7
Halifax, N. S.	39	47.8	Truckee, Cal.	20	48.8
Harrisburg, Pa.	32	63.9	Union, Fort, N. Mex.	37	57.9
Howard, Fort, Wis.	22	55.7	Washington, Ark.	22	69.8
Humboldt, Nev.	20	58.8	Wingate, Fort, N. Mex.	27	60.1
Indianola, Tex.	15	76.1	Winnipeg, Man.	22	52.2
Kingston, Ont.	21	53.4	Wycheville, Va.	25	61.4
Klamath, Fort, Oregon	19	49.1	Yarmouth, N. S.	14	47.2
Lausling, Mich.	27	58.7	Yuma, Fort, Ariz.	25	79.6
Lapwai, Fort, Idaho	20	60.3			

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for May, 1891, as determined from the reports of nearly 2,000 stations, is exhibited on Chart III. In the table

of Signal Service data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in